# Commentary

# Accomplishments and Opportunities in Biosurveillance

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Surveillance is the cornerstone of public health. Robust surveillance data and their analysis meaningfully impact public health action, planning, and prioritization. However, as Dr Alexander Langmuir stated in his 1962 Cutter Lecture on Preventive Medicine at the Harvard School of Public Health, "Good surveillance does not necessarily ensure making the right decisions, but it reduces the chances of wrong ones."[1(p191)] Over the past 50 years, the application of computer and information science has improved efficiency and effectiveness of public health surveillance by changing the way we collect, process, and analyze vast and disparate data for research, decision making, and learning. One example is the development of syndromic surveillance systems. What began as an experiment in a few large cities 20 years ago to track over-the-counter sales of antidiarrhea medications as an early warning of outbreaks of gastrointestinal illness expanded substantially after the terrorist attacks of 2001. Today the model has expanded to include many additional sources of real-time or near real-time data and broader uses of those data. Health departments are using data collected from emergency department visits that they receive from hospitals for monitoring conditions for which there are no surveillance systems (eg, opioid overdoses and carbon monoxide poisonings) and for improving public health situational awareness. These syndromic-based systems can continue to improve as additional text fields from the electronic health record (EHR) become part of the data stream. These additional data along with advanced natural-language processing and statistical learning methods may enhance the use of other coded and free-text contextual information. Over time, adaptive machine learning methods could make possible the detection of syndromes that were not prespecified, which could enhance overall surveillance and improve early event detection.

For all the progress made, there remain gaps. It is clear that there is an uneven distribution of informatics capacity across the country. As many of the authors point out, it is not a lack of desire, but a lack of human and financial resources that limits adoption of advanced technology to broader systems thinking. We, collectively as the public health system, need to establish a prioritized and phased approach to upgrade state, tribal, local, and territorial (STLT) health information technology capacity to meet current and future biosurveillance needs. Models exist in "high-resource" health departments, but not all jurisdictions have the capability to query EHRs for data relevant to public health. Enabling electronic public health work flow and data exchange would focus on maximizing interoperability among various systems and mapping subsets of clinical EHR data to meet public health needs.

We should also consider how best to use national platforms, such as hosted by the National Syndromic Surveillance Program, to strengthen or build the capacities at the local level. The tools available on the BioSense Platform—ESSENCE and R as two examples—may be a place to start, as they are free to users and their broad utility is being demonstrated across the country for applications beyond syndromic surveillance. In addition, the Centers for Disease Control and Prevention

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(CDC) Surveillance Strategy aims to enhance surveillance workforce and innovation, accelerate the use of emerging tools and methods, and increase the use of crosscutting integrated platforms.[2] As CDC works to make surveillance systems more adaptable, eliminates redundancies, and reduces reporting burdens, the result for all stakeholders, including STLT health departments, will be improved data availability, quality, and timeliness.

We probably cannot imagine the technological innovations to come over the next 20 years that will better enable us to analyze data and get information to decision makers so that effective actions can be taken. As we ponder the future, we must acknowledge that the technology is of little value without a workforce able to solve multifactorial problems in collaboration with the health care sector. Our public health workforce is well trained, but we must make certain that it is adaptable to current and future demands. Training a workforce capable of collecting and analyzing large volumes of diverse data, as well as integrating that information with nonclinical sources (ie, news reporting, social media, or environmental testing) for biosurveillance purposes, is critical to effectively protecting America's health.

## REFERENCES

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2. Richards CL, Iademarco MF, Anderson TC. A new strategy for public health surveillance at CDC: improving national surveillance activities and outcomes. *Public Health Rep*. 2014;129: 472-476.